NOAA's efforts to map extent, health and condition of deep sea corals and sponges and their habitat on the banks and island slopes of Southern California

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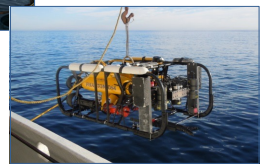
Deep-sea corals in Southern California are diverse and abundant, but subject to multiple stressors, including ocean acidification and commercial fishing. NOAA and others have surveyed these habitats since 2003 using remotely operated vehicles equipped with high-resolution cameras. Surveys 2003-2011 were conducted as part of the groundfish surveys by NMFS to document abundance and distribution of deep water rockfish and flatfish. Recent surveys since 2011 were increasingly focused on deep-sea corals, in-situ measures of aragonite saturation and habitat mapping in notable regions identified in previous years. Surveys mapped abundance, diversity, and fishing pressure and developed a novel priority setting algorithm to identify where future conservation efforts might be most effective.

Research Questions

- What is the vertical and horizontal extent of deep-sea coral and sponge habitat in Southern California Bight? How does species composition vary with depth? Is there overlap with bottom fishing activity?
- Which sites have the highest diversity, abundance, and threat? Are these sites protected from commercial bottom fishing?
- Are there other threats to deep-sea corals and sponges besides fishing that cannot be managed spatially? Is there evidence on injury unrelated to fishing?

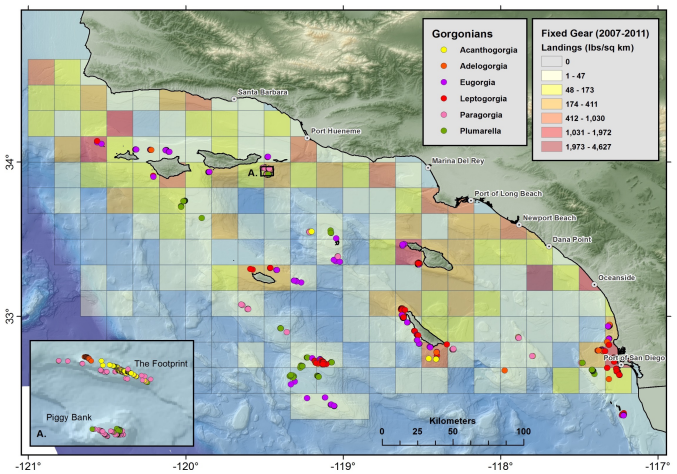
ROV Beagle from MARE

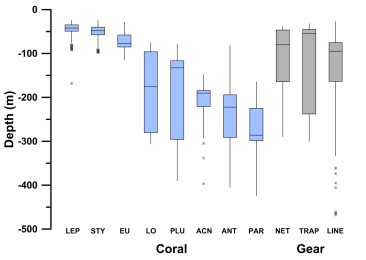


ROV Phantom from NOAA NMFS

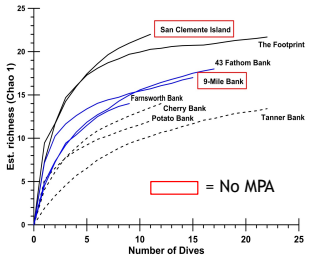
Methods

- Corals and sponges were identified and counted in 10,000+ still images from NOAA benthic ROV surveys for groundfish and abalone in the years 2003 - 2011 to yield abundance, diversity, frequency of fishing debris.
- Commercial fisheries landings of deep-water demersal species (sablefish, thornyhead, rock prawn, etc.) were derived from landing tickets in lease blocks reported to CA Dept. of Fish and Game years 2005-2011 and summarized in a USGS database (Perry et al. 2010) to yield estimates of bottom-fishing intensity.
- Study sites were ranked by priority for conservation using established criteria for rarity, diversity, and threat (Selig et al 2014, PloS One) in a novel algorithm called RAFFi.
- **RAFFi** scores are cumulative scores (0-4) from the sum of individual scores (0-1) for coral and sponge **R**ichness (Simpson's diversity index), **A**bundance, **F**requency of occurrence, and **F**ishing **I**ntensity.

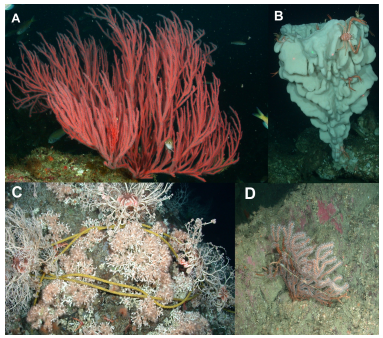




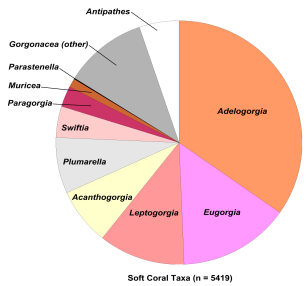
Vertical distribution of corals and fishing gear



Diversity of corals and sponges at 8 study sites



Corals, sponges, and fishing gear.



Pie-chart of deepwater soft coral genera

RAFFi index

A method for prioritizing deep-sea coral and sponge habitat for management and conservation

		R		A		F		FI		RAFFI
Locality	**Sample size**	**Simpson's Index**		**Abundance**		**Frequency**		**Fishing Intensity**		**Total**
Site name	*Dives*	*Value*	*Score*	*C Score*	*S Score*	*C Score*	*S Score*	*G Score*	*Landings*	*Score*
Piggy Bank	6	9.2	**1.03**	**0.39**	**0.10**	**0.50**	0.19	0.06	0.30	**2.57**
The Footprint	**28**	6.21	0.70	**0.50**	**0.50**	0.17	0.33	0.08	0.30	**2.57**
Santa Catalina Is	2	4.67	0.52	0.11	0.00	**0.40**	0.00	**0.47**	**0.50**	**2.00**
Farnsworth Bank	9	4.05	0.45	**0.25**	0.00	0.19	0.02	**0.50**	**0.40**	**1.81**
San Clemente Is	11	8.73	**0.98**	0.06	0.02	0.07	0.13	0.07	**0.40**	**1.73**
9 Mile Bank	15	8.21	**0.92**	0.09	0.05	0.06	0.12	0.09	0.30	1.63
43 Fathom Bank	**18**	3.24	0.36	0.12	**0.23**	0.05	**0.43**	0.29	0.10	1.58
109 Seamount	1	5.64	0.63	0.11	0.04	0.22	0.13	**0.34**	0.00	1.47
San Nicolas Is	11	5.74	0.64	0.02	0.02	0.02	0.14	0.05	0.30	1.19
Cortes Bank	9	7.09	0.80	0.05	0.02	0.05	0.13	0.04	0.00	1.08
Santa Barbara Is	7	5.58	0.63	0.02	0.03	0.02	0.18	0.05	0.10	1.02
Potato Bank	11	3.35	0.38	0.01	0.06	0.00	0.34	0.02	0.20	1.01

Results and Conclusions

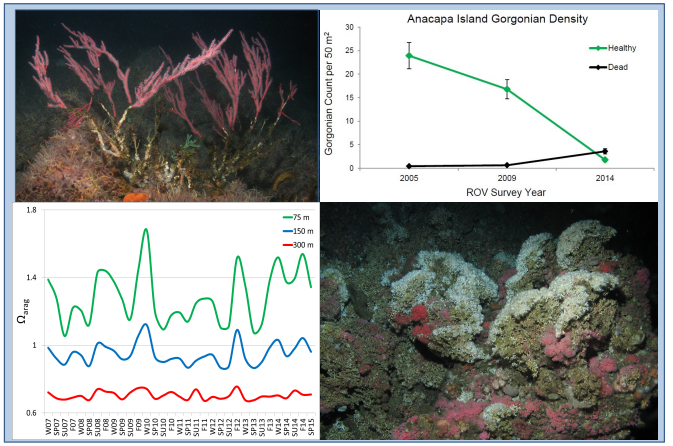
•Deep corals and sponges are abundant and diverse in Southern California. There are two distinct coral assemblages between 45 and 300 m. Deep sites had highest diversity.

•Fishing gear was commonly observed in and around corals. The most common gear type was lines. Nets and traps were also observed.

•There is vertical and geographic overlap among deep corals, sponges and demersal fisheries. Fixed gear fisheries have a larger geographic footprint than mobile gear (trawl) fisheries.

•The top ranked, highest priority sites are protected from deep bottom fishing by MPAs, except in two cases - San Clemente Island and 9 Mile Bank.

Can we protect deep-sea corals and sponges from a changing climate?



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NOAA Deep Sea Coral Research & Technology Program
https://deepseacoraldata.noaa.gov/